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Ultraviolet Radiation Penetration Through Clothing

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Introduction

- Exposure to ultraviolet radiation can result in significant health risks
- The primary organs affected are the eyes and the skin
- Eyes: Inflammation of the cornea and conjunctiva
- Skin: Erythema, sunburn, accelerated aging and cancer
- Protective eyewear and clothing can reduce injuries
- Effectiveness of clothing in reducing ultraviolet exposure was investigated

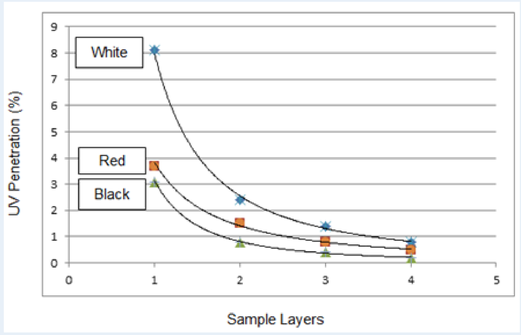
Background

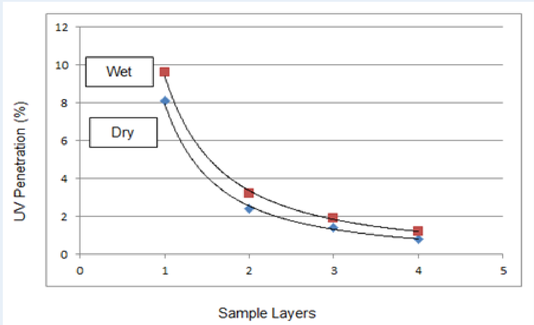
- Workers exposed to intense outdoor sunlight conditions are at increased risk of UV related injuries
- Safety criteria have been established by the American Conference of Industrial Hygienists (ACGIH)
- To determine the protective clothing required, knowledge about UV penetration characteristics is needed
- Laboratory experiments were conducted to determine these characteristics

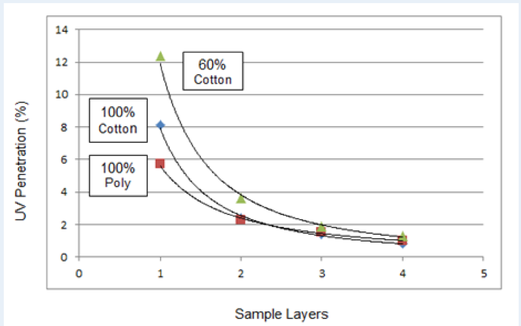
Methods

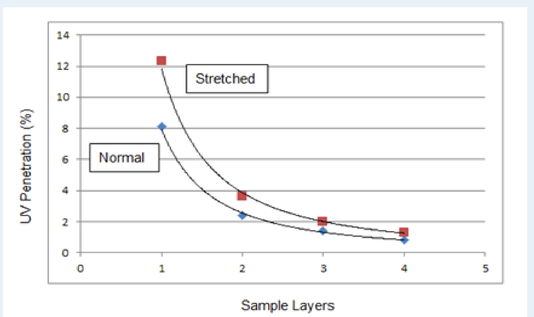
- Controlled laboratory experiments were performed to assess UV penetration through selected fabric materials
- 15cm² samples were exposed to 11.5 Watts/m² radiation intensity level
- Each sample was measured three times and the average calculated
- Samples were measured for dry, wet, and stretched conditions
- The equipment used for conducting the tests is illustrated in Figure 1

Analysis







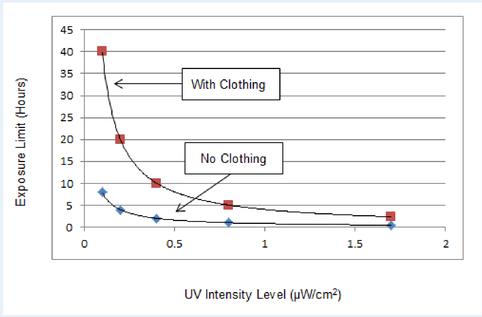


Results

Garment Sample	Ultraviolet Radiation Penetration (%) (Single layer)
100% Cotton	
o White	8.1
o Red	3.7
o Black	3.1
100% Cotton	
o Dry	8.1
o Wet	9.6
100% Cotton	
o Normal	8.1
o Stretched	12.3
Cotton	
o 100%	8.1
o 60% / Polyester	12.4
Polyester	
o 100%	5.7
o 40% / Cotton	12.4
Human Hair	
o Dry	4.9
o Wet	4.8

Conclusions

- All fabric samples tested exhibited good UV penetration protection
- Light colored fabrics exhibited lower UV protection than dark fabrics
- Synthetic fabrics provided more protection than natural textiles



Equipment

Figure 1.
UV Measurement Equipment